Small Business Innovation Research/Small Business Tech Transfer

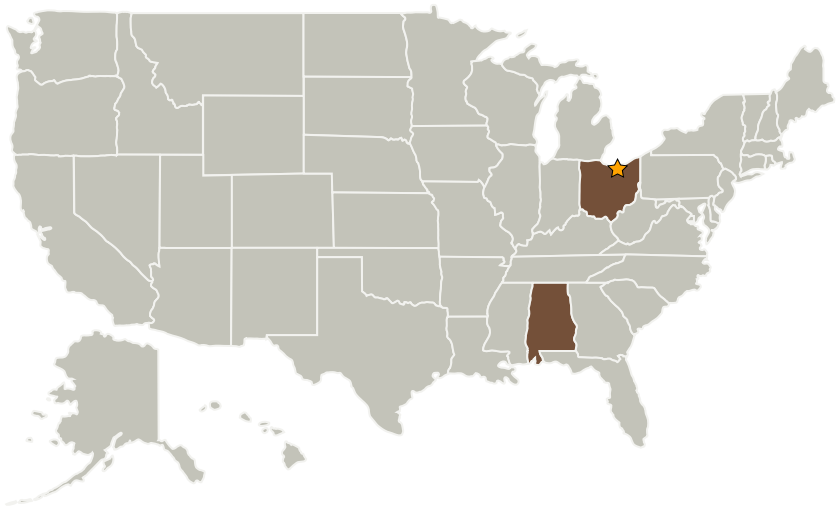
Understanding and Mitigating Adverse Health Effects in Space Using A System Physiology Software, Phase I

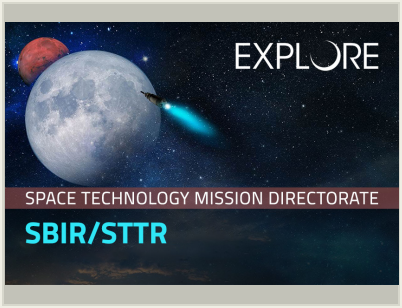
Completed Technology Project (2005 - 2005)

Project Introduction

NASA's vision for Space Exploration aims for human interplanetary missions that have significant challenges on crew health and safety including fluid shifts, and post-flight orthostatic intolerance. A predictive software tool that advances the understanding of underlying biofluid dynamics is critical to affordably analyzing and designing protective systems and countermeasures. CFDRC proposes to develop such software that will enable new insights and techniques to significantly increase the knowledge base through simulations and dramatically increase the leverage of limited in-flight cardiovascular investigations. In Phase I, we seek to develop an innovative network-based System Physiology Software tool, leveraging an ongoing NASA funded lab-on-a-chip system design effort. In the proof-of-concept study, a physiologically relevant component network representing elements of the human circulatory system will be assembled in a user-friendly GUI environment. This network, interfaced with high-fidelity multiphysics software (CFD-ACE+) will be solved for detailed analysis of local hemodynamic stresses on vascular endothelial cell structure, and compute microgravity effects on fluid shift. In Phase II, component models will be refined with detailed representation for arterial, venous and lymphatic effects, along with incorporation of metabolite transport and baroreflex models. Interface to systems biology models (cellular regulatory networks) will also be developed. CFDRC is the technology leader in multiscale biological simulations and very well placed to successfully undertake this challenging task of delivering System Physiology Software to NASA.

Primary U.S. Work Locations and Key Partners





Understanding and Mitigating Adverse Health Effects in Space Using A System Physiology Software, Phase I

Table of Contents

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Glenn Research Center (GRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Small Business Innovation Research/Small Business Tech Transfer

Understanding and Mitigating Adverse Health Effects in Space Using A System Physiology Software, Phase I

Completed Technology Project (2005 - 2005)

Organizations Performing Work	Role	Type	Location
★Glenn Research Center(GRC)	Lead Organization	NASA Center	Cleveland, Ohio
CFD Research Corporation	Supporting Organization	Industry	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	Ohio

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

S. Krishnamoorthy

Technology Areas

Primary:

- TX14 Thermal Management Systems
  - TX14.2 Thermal Control Components and Systems
    - TX14.2.5 Thermal Control Analysis